

REMARKS

I. Status of the Application

Claims 25-27, 29-38, 40-43, and 47-52 are pending in the application. Claims 28, 39, and 44-46 have been cancelled without prejudice to the filing of any appropriate continuation applications.

Claims 25, 27, 29, 32-34, 37, 40, and 48-52 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Pisecky et al. (U.S. Patent No. 4,141,783, hereinafter “Pisecky”) in view of Badertscher (GB 2 036 534) and further in view of Den Hollander (U.S. Patent No. 5,558,819).

Claims 26, 30, and 31 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Pisecky in view of Badertscher and Den Hollander as applied to claim 25, and further in view of Rubens (EP 0 438 783).

Claims 35 and 36 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Pisecky in view of Badertscher and Den Hollander as applied to claim 25, and further in view of Arndt (U.S. Patent No. 3,843,828).

Claims 38 and 41 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Pisecky in view of Badertscher and Den Hollander as applied to claims 37 and 40, and further in view of Bond et al. (U.S. Patent No. 5,210,958, hereinafter “Bond”).

Claim 42 stands rejected under 35 U.S.C. §103(a) as being unpatentable over Pisecky in view of Badertscher, Den Hollander, and Bond as applied to claim 41, and further in view of Hovmand et al. (U.S. Patent No. 4,062,641, hereinafter “Hovmand”).

Claim 43 stands rejected under 35 U.S.C. §103(a) as being unpatentable over Pisecky in view of Badertscher and Den Hollander as applied to claim 25, and further in view of Johnston (U.S. Patent No. 2,401,077).

Claim 47 stands rejected under 35 U.S.C. §103(a) as being unpatentable over Pisecky in view of Badertscher and Den Hollander as applied to claim 25, and further in view of Bosund et al. (U.S. Patent No. 4,091,003, hereinafter “Bosund”).

Applicant has amended the claims under consideration to more clearly define and distinctly characterize Applicant’s novel invention. Specifically, independent claim 25 has been amended to recite that the temperature in the mixing chamber is between about 120°C and 250°C. Support for this amendment can be found throughout the specification as filed, for example at page 9, lines 16-21. Applicant respectfully submits that the amendment presented herein does not raise new issues requiring further search, and adds no new matter. Applicant respectfully requests entry and consideration of the foregoing amendment in view of the following remarks, which are intended to place the case in condition for allowance.

II. The Pending Claims Are Non-Obvious over the Cited Art

At page 2, section 5 of the instant Office Action, claims 25, 27, 29, 32-34, 37, 40, and 48-52 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Pisecky in view of Badertscher and further in view of Den Hollander. At page 5, section 6 of the instant Office Action, claims 26, 30, and 31 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Pisecky in view of Badertscher and Den Hollander as applied to claim 25, and further in view of Rubens. At page 6, section 7, claims 35 and 36 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Pisecky in view of Badertscher and Den Hollander as applied to claim 25, and

further in view of Arndt. At page 7, section 8 of the instant Office Action, claims 38 and 41 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Pisecky in view of Badertscher and Den Hollander as applied to claims 37 and 40, and further in view of Bond. At page 8, section 9 of the instant Office Action, claim 42 stands rejected under 35 U.S.C. §103(a) as being unpatentable over Pisecky in view of Badertscher, Den Hollander, and Bond as applied to claim 41, and further in view of Hovmand. At page 8, section 10 of the instant Office Action, claim 43 stands rejected under 35 U.S.C. §103(a) as being unpatentable over Pisecky in view of Badertscher and Den Hollander as applied to claim 25, and further in view of Johnston. At page 9, section 11 of the instant Office Action, claim 47 stands rejected under 35 U.S.C. §103(a) as being unpatentable over Pisecky in view of Badertscher and Den Hollander as applied to claim 25, and further in view of Bosund. Applicant respectfully traverses these rejections.

The amended claims are directed in part to a method for pasteurizing or sterilizing a product in liquid form which includes a heat sensitive substance. A step of the claimed method comprises substantially atomizing the product while admixing steam in a mixing chamber heated by the steam so as to kill microorganisms and produce a pasteurized or sterilized product. Further limitations of the claimed method include the residence time of the product in the mixing chamber being between about 0.2 msec (milliseconds) and 20 msec, and the temperature in the mixing chamber being between about 120°C and 250°C. Atomization of the product with steam inside the mixing chamber provides for rapid heat transfer from the steam to the product, which serves to pasteurize or sterilize the product during a heating or residence time in the mixing chamber much shorter than standard. As attested to by Dr. Thomas Snoeren in the expert declaration filed concurrently with this response, atomization of a liquid product mixed with steam for a residence time and at heating temperature according to the claimed method is critical

for pasteurizing or sterilizing the product without substantially decomposing or otherwise substantially chemically altering the heat-sensitive substances in the product to an unacceptable degree. In particular, one or more of the following may be substantially avoided or greatly reduced:

- Denaturation and polymerization of proteins,
- Inactivation of vitamins (e.g. due to degradation or other reactions),
- Reaction of protein hydrolysates with sugars, resulting in an undesired increase of the molecular weight of the hydrolysate,
- Occurrence of Maillard reactions, which generally cause a loss of nutritional value, undesired browning of the product, and/or formation of off-flavors,
- Degradation of polysaccharides such as starch, which may cause a partial loss of the thickening properties of such polysaccharides (overcooking/dextrinization),
- Formation of undesired by-products, such as lactulose and lysinoalanine.

A. The Combination of Pisecky, Badertscher, and Den Hollander Fails to Render the Claimed Invention Obvious.

The Examiner relies upon Pisecky for teaching atomization of a liquid while admixing steam in a mixing chamber such that the liquid is pasteurized. The Examiner is of the opinion that the drying chamber of Pisecky may be considered a “mixing chamber” because the atomized liquid product is mixed with hot air in Pisecky’s drying chamber (column 6, lines 39-43). Applicant respectfully disagrees. Applicant maintains the position that Pisecky fails to teach or suggest substantially **atomizing** the product in liquid form while admixing with steam **in a mixing chamber heated by the steam**, as recited in claim 25. Instead, the drying chamber of Pisecky is heated by hot air (column 6, lines 38-42), which is not the equivalent of steam (water

in gas phase). The skilled artisan would expect that hot air used for drying purposes would have very low moisture content so that it can absorb water from whatever it is drying. The Examiner may wish to argue that since steam heats the liquid product inside the atomizer compartment of Pisecky, when ejected from the atomizer, steam also heats the drying chamber. However, steam ejected from the atomizer does not heat the drying chamber of Pisecky. The atomizer of Pisecky provides for degasification of the liquid product **prior to atomization** (column 2, line 66 to column 3, line 13) by heating the liquid product with steam inside the atomizer (column 4, lines 6-9) and then separating gas (a mixture of air and steam) from the liquid product under considerably lower pressure (column 6, lines 32-37 and 43-52). One of ordinary skill in the art would understand that the temperature will drop when gas is evaporated, or removed from solution under partial vacuum, or expanded under reduced pressure. Pisecky discloses in Example 1 that a mixture of steam and skimmed milk concentrate before atomization has a temperature of 101°C, which temperature will only go down once degasification occurs and the mixture of air and steam is ejected into the drying chamber. So instead of being heated by steam, hot drying air is supplied to heat the drying chamber (Example 1 of Pisecky). Therefore, the drying chamber of Pisecky cannot be a mixing chamber heated by steam and having a temperature between about 120°C and 250°C, as recited in independent claim 25. Since Pisecky clearly teaches atomization in the drying chamber outside of the chamber where steam is mixed with liquid product, Pisecky fails to teach or suggest atomization inside a mixing chamber heated by steam.

As submitted in the previous response to Office Action filed on January 22, 2007 and incorporated herein by reference, Pisecky is silent with regard to pasteurization or sterilization. Thus, Pisecky does not disclose or suggest a method that both pasteurizes or sterilizes a liquid

product and avoids or at least substantially reduces detrimental effects to heat-sensitive substances, let alone a method that atomizes the liquid product while admixing with steam in a mixing chamber heated by the steam, wherein the temperature in the mixing chamber is between about 120°C and 250°C, and the residence time of the product in the mixing chamber is between about 0.2 msec and 20 msec.

Badertscher fails to remedy the deficiencies of Pisecky. Badertscher is directed to sterilization of liquids without drying. Badertscher fails to teach or suggest atomization of a liquid product mixed with steam in a mixing chamber heated by the steam, let alone that sterilization would be effected by atomizing the product with steam inside the mixing chamber.

The Examiner relies upon Den Hollander to teach a method of pasteurizing or sterilizing milk with steam in less than one second. But Den Hollander fails to remedy the deficiencies of Pisecky. Den Hollander also fails to teach or suggest **atomization** of a liquid product mixed with steam in a mixing chamber heated by the steam. Instead, Den Hollander teaches that the liquid is introduced into the downflow heater plant as liquid jets which can be very elongated and retain their shape, and that steam condenses on the liquid jets (col. 2, lines 4-8, lines 17-21, line 33). The Examiner comments that the disclosure does not provide criticality or unexpected results with regards to keeping the liquid product in the mixing chamber for about 0.2 msec to about 20 msec. As supported by reasons provided in the expert declaration of Dr. Thomas Snoeren filed concurrently with this response, and incorporated herein by reference, atomization of a liquid product mixed with steam in a mixing chamber for a residence time between about 0.2 msec and 20 msec and at temperatures between about 120°C and 250°C is critical for pasteurizing or sterilizing the product without substantially decomposing or otherwise substantially chemically altering the heat-sensitive substances in the product to an unacceptable

degree. Dr. Snoeren also declares that Den Hollander fails to teach or suggest to the skilled artisan a residence time of about 0.2 msec to 20 msec, because such a short free fall time would render the downflow heater device of Den Hollander so small as to be unfit for its original purpose of heating large amounts of liquid in a milk processing plant.

For at least the foregoing reasons, the combined disclosures of the cited references fail to teach or suggest that pasteurization or sterilization can be effected by atomizing a liquid product mixed with steam in a mixing chamber heated by the steam, wherein the temperature in the mixing chamber is between about 120°C and 250°C, and the residence time of the product in the mixing chamber is between about 0.2 msec and 20 msec, which conditions are critical to substantially avoid heat damage to heat-sensitive substances in the product. In so far as the cited references disclose pasteurization or sterilization, the cited references teach or suggest heating/residence times at least 50 times and two orders of magnitude longer than 0.2 to 20 msec. The skilled artisan would not be motivated by the cited references to modify the teachings of Pisecky to atomize the liquid product mixed with steam in a mixing chamber heated by the steam, instead of atomizing in a drying chamber heated by hot air. Accordingly, Applicant respectfully requests reconsideration and withdrawal of the 35 U.S.C. §103(a) rejection and allowance of claims 25, 27, 29, 32-34, 37, 40, and 48-52.

B. Any combination of cited references fails to render the claimed invention obvious.

None of the remaining references, alone or in combination, cures the deficiencies of the references discussed above.

Rubens fails to cure the deficiencies of Pisecky, Badertscher, and Den Hollander. Rubens is directed to a method of cooking/gelatinizing and spray-drying starch (abstract, page 3, lines 17-18). Starch is a polysaccharide, which is one of the heat-sensitive substances

(specification page 4, lines 20-24) that Applicant's invention leaves substantially undamaged after pasteurizing or sterilizing the product. Rubens' disclosed method, however, intentionally heat-damages (cooks/gelatinizes) the starch slurry. Thus, Ruben teaches away from and so fails to provide motivation for atomizing a liquid product mixed with steam in a mixing chamber heated by the steam and having a temperature between about 120°C and 250°C for a short enough period of time (about 0.2 to 20 msec) to substantially avoid damage to heat-sensitive substances.

Arndt fails to cure the deficiencies of Pisecky, Badertscher, and Den Hollander. Arndt is directed to methods of blending sweet dairy whey and an isolated, non-animal protein using a specific heat and pressure treatment (col. 2, lines 8-38). Arndt teaches that said ingredients are suspended and then mixed with steam in a holding chamber for about 7 to about 100 seconds (col. 5, lines 44-47). So Arndt fails to teach or suggest atomizing a liquid product mixed with steam in a mixing chamber heated by the steam and having a temperature between about 120°C and 250°C with a retention time of the product in the mixing chamber of about 0.2 to 20 msec.

Bond fails to cure the deficiencies of Pisecky, Badertscher, and Den Hollander. Bond is directed to a method for drying paper using superheated steam and cylinders heated by saturated steam (abstract). Bond is not related to methods for pasteurization or sterilization or spray-drying, and certainly fails to teach or suggest atomizing a liquid product mixed with steam in a mixing chamber heated by the steam and having a temperature between about 120°C and 250°C with a retention time of the product in the mixing chamber of about 0.2 to 20 msec. The recited pasteurized or sterilized product, once dried, may be reconstituted as a food product. The skilled artisan in pasteurization or sterilization or spray-drying of food products would not be motivated to look to Bond because it is in the nonanalogous art field of paper-making.

Hovmand fails to cure the deficiencies of Pisecky, Badertscher, and Den Hollander. Hovmand is directed to an agglomerating unit which deposits moistened powder on its conical inner surface (abstract). Hovmand is not related to methods for pasteurization or sterilization, and certainly fails to teach or suggest atomizing a liquid product mixed with steam in a mixing chamber heated by the steam and having a temperature between about 120°C and 250°C with a retention time of the product in the mixing chamber of about 0.2 to 20 msec.

Johnston fails to cure the deficiencies of Pisecky, Badertscher, and Den Hollander. Johnston is directed to a method for sterilizing liquids such as milk and milk products (page 1, left column, lines 1-4). Johnston teaches that the product traverses the sterilizing chamber inside six seconds (suggesting close to six seconds), during which time the heat treatment is continued (page 2, left column, lines 65-69, page 3, right column, lines 15-21). Thus, Johnston fails to teach or suggest atomizing a liquid product mixed with steam in a mixing chamber heated by the steam and having a temperature between about 120°C and 250°C with a retention time of the product in the mixing chamber of about 0.2 to 20 msec.

Bosund fails to cure the deficiencies of Pisecky, Badertscher, and Den Hollander. Bosund is directed to a process for preparing a protein isolate from fish material (abstract). Bosund is not related to methods for pasteurization or sterilization, and fails to teach or suggest atomizing a liquid product mixed with steam in a mixing chamber heated by the steam and having a temperature between about 120°C and 250°C with a retention time in the mixing chamber of about 0.2 to 20 msec.

For at least the foregoing reasons, the combination of references fails to teach or suggest or provide motivation to combine teachings to arrive at the claimed invention. Accordingly,

Applicant respectfully requests withdrawal of the 35 U.S.C. §103(a) rejection and allowance of claims 26, 30, 31, 35, 36, 38, 41-43, and 47.

III. Conclusion

Having addressed all outstanding issues, Applicant respectfully requests reconsideration and allowance of the present application. To the extent the Examiner believes that it would facilitate allowance of the case, the Examiner is requested to telephone the undersigned at the number below. The Commissioner is hereby authorized to charge any additional fees or credit overpayment to Deposit Account No. 19-0733.

Respectfully submitted,

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